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Dr. John T. Billings  
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of Rudolph Matas

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REPORT OF THE CASE

OF A

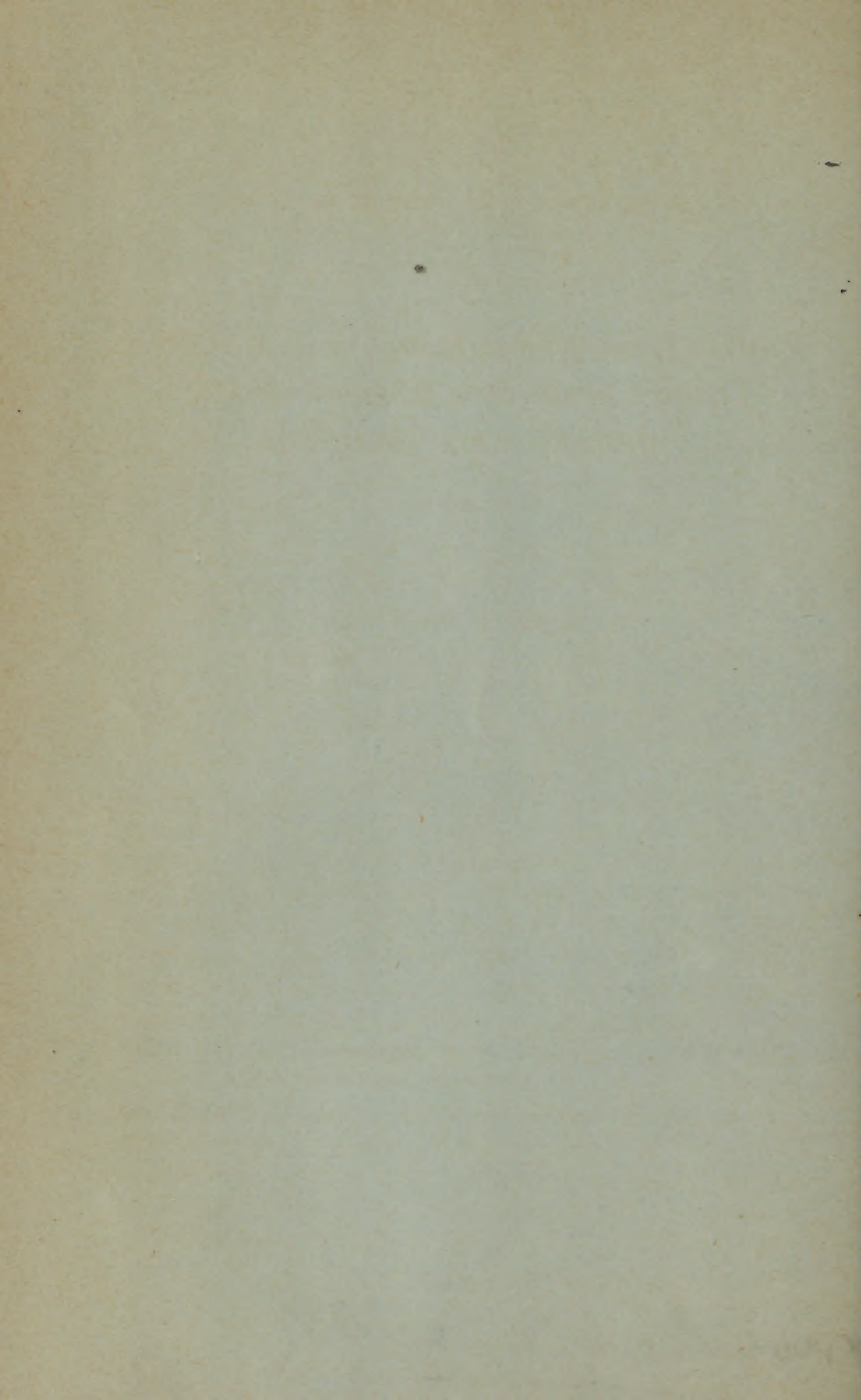
Patient from Whose Subcutaneous Tissue  
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WITH REMARKS.\*

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Visiting Surgeon, Charity Hospital, New Orleans; Demonstrator of Anatomy,  
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## Patient from Whose Subcutaneous Tissue Three Larvæ of a Species of Der- matobia were Removed,

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Visiting Surgeon, Charity Hospital, New Orleans; Demonstrator of Anatomy,  
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On the morning of June 27th H. T. McC., an Englishman, aged 38, presented himself at my clinic in ward 8, Charity Hospital, stating that he had arrived in this city, one week before, from an extensive trip to Spanish Honduras, where, on or about the 11th of this month (June), he had been stung, while bathing, by a peculiar fly, which was well known in that country, as it was a veritable nuisance, if not a scourge, because it attacked man and beast alike—the white foreigners especially—and deposited its ova in the sting, wherein the “worms” (larvæ) developed until they attained considerable dimensions—half to three-quarters of an inch in length, according to the patient’s statement. He further stated that he remembered the moment when the fly stung him, for he heard it “buzz,” and “sting” him in three distinct places

\*Read before the New Orleans Medical and Surgical Association.

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*presented by the author.*

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on his body, where he was sure the "worms" were now growing, "though they must be still quite young and small, on account of the comparatively short time that they had been in the flesh"—*i. e.*, sixteen days since ova had been deposited.

We then examined the patient, who, after undressing, showed us three red, hard, furuncular swellings, situated—one on the right side of the intergluteal furrow, about two or three inches from tip of coccyx, and two other similar, though smaller, elevations on the left side of the same furrow and closely adjoining one another. The first, which was the most prominent, was elevated at its highest portion about one-quarter of an inch from the level of the surrounding skin, and presented a circular area of inflammatory hardness which measured about one and one-quarter inch in diameter. Upon careful and minute inspection the largest furunculoid mass was found to present in its most elevated and central portion a minute orifice, which might admit the point of a coarse bristle. The other two swellings presented also one central point each, where a little puriform crust had become fixed, indicating the original seat of puncture and entrance to the larval sinus.

Trusting to the patient's account of himself, we proceeded to the extraction of the parasites—a procedure which the patient urgently requested. Guided by the orifice in the elevation I cut with the point of a bistoury into the very centre of the swelling, but discovered, however, that by simply cutting *vertically* I had not incised the cavity wherein the larvæ lay concealed, and was obliged to again incise obliquely and to the right in order to expose the parasitic burrow. This oblique direction of the larval sinus I found to be constant in each of the three "stings." I found that the larvæ were lodged immediately under the derma proper, so that in getting at them, in order to expose them thoroughly, I had to cut completely through the skin, which, in the gluteal region is particularly thick. It was discovered also that a simple incision was insufficient

to remove the larvæ, and that digital expression, and this very forcibly applied, was necessary in order to induce them to relinquish their stronghold. In fact, the two last larvæ were removed more by this means than by incision, the orifice of the sinus having been simply incised in order to enlarge the orifice of exit, and the parts expressed by pinching them in a fold of skin. The patient stated that in Honduras the natives usually rid themselves of these unpleasant guests by applying hot tobacco ashes to the parts and following this up by digital expression. This is a rather general treatment for parasitic dermal affections in Latin-American countries, where tobacco is always on hand. In our patient's case we cauterized the cavity or sinus left by the evacuation of the larvæ with pure carbolic acid, for fear that the septic products of larval nutrition might tend to create inflammatory mischief. I was led to this precaution because of the unfortunate results which followed the extraction of similar parasites in another case, that of a Frenchman, also from Honduras, who was admitted in the same ward during my absence, about twelve months before, and who nearly succumbed to a most violent and disastrous attack of erysipelas, which supervened immediately after the slight traumatism inflicted in the extraction. The larvæ had been deposited in the inner surface of the left arm, and from this point the inflammation spread on all sides, swelling up the whole extremity and left thoracic region. Subcutaneous suppuration, accompanied by gangrene, followed, finally leaving the arm in a state of permanent contraction, in the flexed position, as the result of cicatricial action. Happily, in the present case, the extraction of the larvæ has not been followed by any excessive inflammatory reaction, owing, perhaps, to the general good health enjoyed by the patient at the time of the operation.

Since this case has come under my observation I have been informed that similar instances of larval deposits in the skin have not been rare in the hospital, at least since the Panama Canal and other enterprises have increased the



traffic between this port and the Central American republics. I have been informed, in fact, that on one occasion quite a number of returning laborers or immigrants were admitted in various wards of the Charity Hospital suffering with these parasitic larvæ. But of these cases no report has been presented thus far, and, to my knowledge, at least, no attempt has been made to discover the parentage of the larvæ or even to determine their proper entomological characters. The specimens removed from my patient are the first that I have seen, and I believe are the first that have been preserved for examination, and, certainly, for the inspection of this association. At any rate, these larvæ are certainly not familiar to our parasitic pathology, for our texts, and even those that devote special attention to parasitology (Cobbold, Leuckart, Davaine), are almost barren of all information in regard to them; so that it is necessary to appeal to the special entomologists in order to obtain some clear notions as to their exact taxonomic characteristics.

In view of our prospects of increased relations with Spanish America, and of the probability of a future importation of similar specimens, I have thought it a matter of some interest to this society to inquire into the natural history of these hypodermatic parasites, in order that we may at least possess ourselves of some clear ideas respecting them, so that they may prove more familiar acquaintances when we are again confronted by them.

The three specimens that are now under the microscope before you are mounted in a glycerine cell, a preparation which was kindly made at my request by the gentlemen in charge of the pathological department of the hospital. The larvæ (see figure 1) are smaller than they appeared in life, as they have contracted slightly. The largest of these measures about four or five mm. in its long diameter and is about one and one-half mm. in breadth. To the naked eye they present an elongated pyriform or clavate appearance, the broad, thick and rounded portion corresponding to the head and trunk, which were the parts

furthest from the surface of the skin; the long, tapering or caudal extremity pointed upwards, so that in squeezing the larva out of its lodgment the tail end appeared first. As

**Fig. 1**

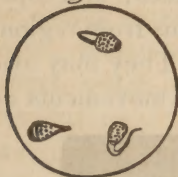


FIG. 1.—Three larvæ as they appeared to naked eye immediately after removal from patient.

the caudal extremity presented itself a dark red dot was visible at the very extremity. This corresponded to the dark anal extremity containing the stigmata for respiratory purposes, and is characteristic of, though not peculiar to, the *dermatobia* larvæ.

This is the normal position of these parasites in general, for the respiratory apparatus which is attached to the caudal portion, close to the anus, is placed near the opening originally made by the sting of the parent fly, in order that they may be as close as possible to the atmosphere. When the larvæ were extracted they wriggled quite actively in their vermicular movements, and continued to move until they were embalmed in the cell five or six hours after their extraction.

On microscopical examination of the most perfect specimen (with a low power  $\frac{3}{4}$  obj. B. and L. eye-piece B.) a remarkable appearance is presented. The major portion of the parasite is seen to consist of an elongated, pyriform, tuberoso or exaggerated clavate body, apparently concave on the ventral aspect and convex dorsally, terminating in a long, tapering, glabrous, elongated-pyramidal extremity. The broader and truncated part of the larva is opaque, and none of the contained organs can be distinguished. The external surface presented the curious appearance which is well displayed in figure 2 (*a* and *b*). Corresponding to the three dark zones distinctly outlined with the naked eye are seen three *double* rows of black hooklets or spines, which are distinctly shaped, when examined carefully, like the thorns of a rose stem. They are lamelliform, sharply pointed at the ends, and are curved and directed (the majority) towards the



caudal extremity, so that, if embedded in the tissues lining the larval sinus, they would offer a resistance to caudal traction in direct ratio to the force employed. This arrangement is manifestly calculated to assist the larva in retaining its position in the subcutaneous tissues, and especially in preventing any involuntary migrations from regions subjected to great muscular disturbance. They may also assist in burrowing, though advance or head movements do

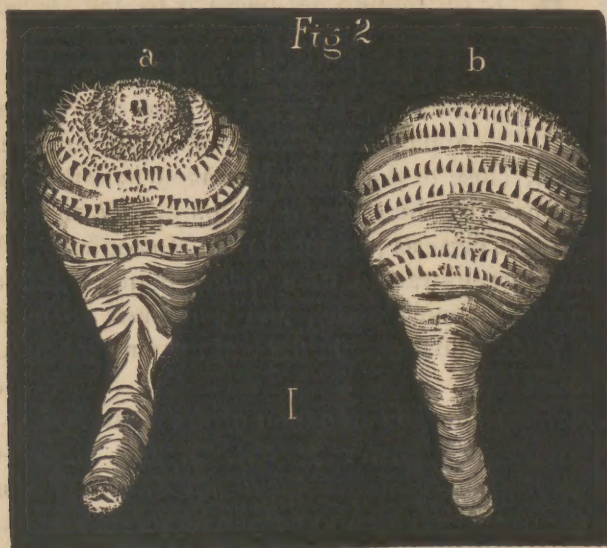


FIG. 2.—One of the larvæ viewed in its (a) ventral and (b) dorsal aspects. *a*, shows ventral aspect and the appearance of cephalic and caudal extremities, also shows that the three rows of spines are single below, while the dorsal view (*b*) indicates that they are double above. The point where the double rows end is also shown in the ventral view, *a*. Hair-line between figures indicates the amplification. [From drawings made for the author by the U. S. Dept. of Agriculture, Entomological Div.]

not appear to be habitual with these larvæ, as they, in common with most ectodermic parasites, are not anærobic (to use a Pasteurian phrase), but require the presence of atmospheric oxygen for their maintenance.

As regards the disposition of the spines it is a noticeable fact that they differ markedly as to their arrangement, according to the aspect of the parasite examined. Thus, as is plainly shown in figure 2 (*a* and *b*), the three rows of spines are single on the ventral and double on the dorsal



aspect, the point where the double row ceases being plainly shown in *a*. This peculiarity is also distinctly exhibited in the species illustrated by figure 4, plainly indicating the relationship that exists between them.

The only segments that are distinctly outlined are the first, which represents the cephalic end, containing the oral cavity, armed with two styles, figure 2 (*a*), and the second, which immediately follows it. As these specimens have shrivelled considerably since the time of extraction the segmentation is not as plainly visible as it should be.

The caudal extremity is also distinctly shown, though the details of the stigmatous organs are not as plainly delineated as desirable, as the stigmata are doubtless hidden within the anal fissure. In this respect they differ from Brauer's (figure 4, *a, b, c*) and Coquerel's (figure 4, *d*), specimens of similar larvæ, with which they appear to be otherwise closely related.

In addition to the three rows of hooklets a large number of small punctiform and blackish tuberosities are seen dotted in a somewhat concentric manner above the upper row, on the two upper segments and the vicinity of the oral point.\*

From the preceding description and the facts furnished by the patient as to the circumstances by which he was made the host of these unpleasant guests, it is quite plain that these parasites—"beef or screw worms of Honduras," as my patient said they were called in that country by the English-speaking residents—are the larvæ of the species of gadfly (*æstrus*), which may be peculiar to Central America, but which, from the imperfect entomological analysis of the specimens removed from my case, I would regard as the offspring of the *æstridæ* or gadflies, which

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\*I must here express my great indebtedness to Mr. L. O. Howard, of the Entomological Division of the United States Department of Agriculture, Washington, D. C., without whose valuable co-operation I would not have been able to distinguish in the specimens some of the details above described, especially the character of the cephalic and caudal extremities, which I had not been able to make out clearly, owing to defective mounting. I am also deeply indebted to him for the beautiful drawings of figure 2, which were expressly designed for me from the specimens sent to him for examination. The authoritative and valuable remarks of Mr. Howard on these larvæ will be found in the latter part of this paper, where they have been placed in order not to materially alter the text of this contribution as originally read before the New Orleans Medical and Surgical Association.

entomologists have already classed in a special order known as the *Dermatobia* (from *derma*, skin, and *bios*, life). The fact that the larvæ were comparatively young—less than sixteen days old—and were much smaller than the more mature “worm,” according to the patient’s statement, may also explain certain slight differences in configuration. It is much to be regretted that the parent fly is also wanting to complete and define the exact classification of the specimens; but I believe that even with all these deficiencies I will be quite safe in classing these larvæ with the dermatobia.

There are three species of *æstridæ* which especially attack the subcutaneous tissue of man, with the view of depositing their larvæ therein: 1st, the *hypoderma bovis*, which in Europe preferably attacks cattle and rarely man; 2d, the *cuterebra* of Clark (entirely an American order), which attacks beast and man; 3d, the *dermatobia* of Brauer, which were believed to be especially attached to man, but erroneously so, as will be shown further on.

As the natural history of these insects presents many curious and interesting features, you will pardon me if I pause to pass them in review.

The *Hypoderma bovis* is an *æstrus* which closely resembles the drone bee. It possesses a proboscis, but has no distinct palpi; the third segment of the antennæ is transverse; its mouth has the shape of a Y; its third segment is covered with black pubescence; the wings are wide apart, of a brownish color. The female has a longer abdomen than the male. The length of the perfect insect is about eleven to thirteen mm.

The larvæ of this insect grow under the skin of beef and other animals. In shape this larva presents an oval, elongated outline. It is *attenuated in its anterior extremity and thick or enlarged at its posterior end*, differing radically in this respect from the larvæ presented to-night. The horny hooklets which surround the oral orifice of most *æstral* larvæ are in this species replaced by five or six fleshy tubercles covered with spines. These tubercles



surround a mouth which is barely visible, above which may be seen two small tentacula. Its body is formed of eleven segments, and presents the peculiarity that it is *flattened* dorsally, is *convex* abdominally; also differing in this respect from my specimens. Each segment is covered with flattened spines, presenting grooves in their inferior edge. The caudal extremity presents a sack, wherein are placed two stigmata, which look towards one another in the concave portion.

“It is stated that when the presence of the hypodermata is announced by their buzzing the most docile ox is rendered frantic with excitement and becomes intractable. As soon as the ox feels himself attacked he is seen to lower his head, his tail quivers with fear and is projected to a level with his spine, and with one desperate dash he rushes to the nearest stream, where he plunges with the hope of ridding himself of his dreadful enemies. And still the sting of this insect must be very insignificant and barely perceptible to such a large pachyderm as the ox.” (Bocquillon.)\*

This sting is intended purely to enable the female fly to deposit her eggs. In fact, shortly after the ova have been deposited a number of elevations, which may vary from four to one hundred (Sells), are seen on the quadruped, and were compared by Reaumur to the “œdematous bumps which result from a blow suddenly inflicted on the brow.” On the most prominent part of each swelling there is a central orifice, which becomes larger as the swelling progresses. It is into this orifice that the larva places its last segment, and it is through this opening that the air necessary for respiration reaches it. The borders of the openings are usually incrustated with dessicated pus.

When the larva has fully gorged itself with the pus its own presence has created, and when it approaches the time for its transformation into a chrysalis, it retreats backwards, its posterior extremity projects beyond the orifice; the whole body soon follows, and then drops on the

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\*Histoire Naturelle Medicale, G. Baillière, Paris. 1871.

ground, to complete its metamorphosis on the earth, or, preferably, on the dung of its victim.

There is another hypoderma which attacks horses. It selects for its attacks those parts of the animal which are least accessible to the tongue (differing entirely in this respect from the ordinary bot flies (*æstrus equi* and *æstrus hemorrhoidalis*), and there deposits its eggs. It inhabits the northern parts of France, Belgium, Holland, the shores of the Baltic, and is common in many parts of the United States, where the larvæ are more aptly known as "beef worms."

The Cuterebræ.—This order or family of the æstridæ was first established by Bracey Clark, of London, in 1815, who gave them this name (from *cutis*, skin, and *terebrare*, to pierce) because they especially deposited their ova, subsequently larvæ, under the skin.

They were also designated as the *trypoderma* by Tiedeman. The cuterebræ are all natives of the American Continent, which thus far appears to be their exclusive habitat. The true cuterebræ are large flies which spring from parasitic larvæ which have been found under the skin of squirrels, rabbits, kangaroos, etc. Of the perfect insects at least seventeen species, according to Laboulbène (Dict. Encyclopédique—Déchambre), have been described (*C. ephippium*, Letreillé; *C.*, horripilium, Clark; *C. cuniculli*, Fabricius; *C. rufiventris*, Macquart; *C. Buccata*; Fab.) They measure from fifteen to twenty mm., and present the appearance of the ordinary beef gadfly (*hypoderma bovis*). They are brownish or black in color, with the abdomen sometimes blackish-blue on rusty red; the hairs (pubescence) may be blackish, silvery, yellow, etc.

The larvæ closely resemble those of the hypodermata; they are fleshy, very annular and tuberculated, ovoidal, without hooks or spines, and especially obtuse and not attenuated [*clavate*] into a tapering extremity. (Laboulbène.)

Many species of this family, however, have been confounded with those of another, which has only been studied



and differentiated in comparatively recent times, and which I am convinced is the one to which the larvæ that I here present are strictly related. These are the æstridæ of the species known as the dermatobia. This genus was established by Brauer, who described it in the transactions of the Zoological and Botanical Society of Vienna,\* and who included in it many of the species formerly claimed for the cuterebræ by Macquart, Joly, Gaudot, etc.

The leading taxonomic characters by which the perfect dermatobiæ differ from the cuterebræ are the following, according to Prof. Laboulbène: The third segment of the antennæ is longer than the other two together. It is elongated, instead of being oviform or elliptical, as is the case with the cuterebræ. The head is relatively much larger and projecting. The abdomen is flattened, triangular, instead of being vaulted and cordiform.

These insects are extremely interesting, inasmuch as they have been regarded as the exclusive parasites of man under the designation of *æstrus hominis*. Their larvæ were seen and described long before the parent æstrus. It was not until long after, and in fact almost recently, that the perfect insects were discovered.

The existence of larvæ deposited under the skin of man by flies in South America must have been noticed by the earliest travelers and naturalists of those regions. But the French Surgeon Arture† was the first to present the scientific world with a description of one of the species in his account of the ver-macaque or macaco worm, of Cayenne.‡

Linnæus, in his letters to Pallas, had mentioned the larva of an æstrus which was a parasite of man. Gmelin, in the *Systema Naturæ* of Linnæus (edition xiii, I., v. 1788), admitted, after Linnæus and Pallas, an *æstrus hominis*, the larvæ of which lived six months under the

\*Verhandlungen der K. K. Zool. Bot. Gesellschaft in Wien, VOL. X, 1860; and in Monographie del *Æstriden*, 1863.

†I am indebted for the historical account herewith presented to Prof. Laboulbène's valuable summary of the subject in his admirable contribution to Déchambre's Dictionary. Première Série, tome, xxvii, Den-Der. 1882. G. Masson, Paris.

‡Observations sur l'espèce de ver, nommé macaque, Mémoires de l'Académie Royale des Sciences de Paris, p. 72, 1723.

skin without undergoing transformation. Humboldt and Bonpland refer to flies which deposit ova in the skin of man, where they form tumors wherein they reside. (*Essai sur la Géographie des Plantes*, page 136, 1805).

Roulin, Guérin-Méneville and Vallot, in 1833, communicated to the French Academy of Sciences a number of documents relating to the *æstrus hominis*.

Geoffroy Saint-Hilaire and Duméril made a report, on July 15, 1833, on three communications, which related to the existence of the *æstrus* of man. (See also the *Annales de la Société Entomologique de France*, t. iii, p. 518, and the *Bulletin*, p. 85, 1833). The *æstrus hominis* was at that time a leading question, and was very vigorously discussed. Letreille had said authoritatively: Without questioning the veracity of the statements made in regard to this *æstrus* it is nevertheless certain that all these observations are incomplete. I presume to believe that these larvæ more likely pertain to the *musca carnaria* of *Linnaeus* or to some other analogous species, as all the *æstral* larvæ that we are acquainted with inhabit the skin of the herbivora and rodentia (*Nouveau Dictionnaire d'Histoire Naturelle*, etc., t. xxii, p. 270, Paris, 1818). But the facts brought forward by Arture, Howship, Say, de La Condamine, Father Simon and Barrère, and all those collected by Hope in his celebrated *mémoire* (*Transactions of the Entomological Society of London*, vol. ii, pp. 256-271, pl. xxii. 1840), clearly proved that there was a parasitic larva of the human skin which was distinct from that of the ordinary sarcophagous flies.

Justin Gaudot settled this question, however, in a contribution to the *Annales des Sciences Naturelles* (*Zoologie*, 3ème serie, t. iii, p. 221, 1845), in which he described an *æstrus* which resides in the human skin in its larval state, and which has been found in New Grenada (United States of Colombia), where it attacks the skin of cattle as well. This *æstrus* he designated by the name of *cuterebra noxialis*. Since that time the idea of an *æstrus hominis*, exclusively proper to the human species, as believed by



Rudolphi, Raspail, Guérin-Méneville, etc., was abandoned, and all the observations which have followed, such as those of Coquerel and Salli, Friederich Müller and Frantzius, etc., demonstrate that there are no dermatobic larvæ exclusively peculiar to man, but simply that there are species which attack man as well as the lower animals. The synonymy of various recognized species of the genus dermatobia is as follows: In Cayenne, the *ver-macaque* or *macaco worm*; in Brazil, the *berne, ura*; in Costa Rica, *torcel*; in the country of the Mayna Indians, *suglacuru*; in United States of Colombia, *gusano-peludo* or *nuche*; in Mexico, *gusano moyaquil*.

The larvæ of these dermatobias are elongated, terminating in a tapering caudal extremity, provided with thorny hooklets in their anterior half only, and there situated on the superior and inferior borders of their segments.

These larvæ, as demonstrated by the immature specimens shown here to-night, differ from the cuterebræ in the fact that the latter are thick and gathered up into a fleshy mass, not attenuated posteriorly into a long caudal extremity, and are only tuberculated, without presenting the strong and formidable unciform or lamelliform spines which are seen so distinctly in these specimens.

The two *leading* species of dermatobia that have been recognized in the perfect state (imago) are the *dermatobia cyaniventris* (blue-bellied gadfly), described by Macquart in his *Dipteres Exotiques* in 1843, t. 1, p. 19, Paris, under the name of *cuterebra cyaniventris*. (Extrait des memoires de la Société Royale des Sciences de l'Agriculture et des Arts de Lille, 1840). This Brazillian species does not differ from the *dermatobia (cuterebra) noxialis* of Gaudot, except in the blue color of its belly.

The celebrated cuterebra (dermatobia) noxialis of Gaudot (see figure 3), which is the other well-known member of the species, is found in great numbers on the edge of great forests and in the prairies. This insect inspires great dread to wild cattle, which prefer to pass the day in sandy wastes than expose themselves in shady pas-

tures to the multiple and maddening attacks of these enemies.

It is very probable that the dermatobia deposit their eggs in a manner similar to the hypodermata, selecting, according to Gaudot's account, the parts of the body that are least accessible to the mouth or the tail. The female dermatobia appear to be extremely prolific, as on a single beef Gaudot was able to count several hundred larvæ. These



FIG. 3.—A typical Dermatobia.  
"Ver-macaque," Dermatobia  
noxialis, (Brauer).

1. Whole larva.
2. Cephalic portion.
3. Caudal extremity. (From  
Bocquillon).

larvæ cover a large surface of the back of the cattle, forming under their skin, and by their aggregation, a large mass of tumors, from which pus is continually oozing from a multitude of orifices. These openings often accommodate other dipterous insects, which lay their eggs there also, develop into larvæ, and give rise to the foulest sores imaginable. The larvæ of the dermatobia are also found on the head, flanks, tail and the spine; but it is generally on the shoulders that the chief focus of larval aggregation is found.

It has been observed that a larva deposited in the middle of June was metamorphosed into a perfect insect on the 4th of the following August, about two months later.

Justin Gaudot demonstrated that, in addition to man, the cattle and dogs in South America are freely victimized by this fly. He himself was attacked by these dermatobias. "I was stung," he said "in several parts of my body and indiscriminately on all those parts which were unprotected, and ova were deposited in my skin, which grew into larvæ that could not be distinguished from those of cattle or dogs. I even allowed one to remain fifteen days in my thigh, and I was thus able to notice a peculiar suction exercised by the



larvæ early every morning, from 5 to 6 A. M., and which produced a sensation somewhat like that of a needle plunged suddenly into the skin." (Quoted by Laboulbène.)

J. Gaudot also writes that in South America the people employ methods quite similar to those followed in Europe to dislodge the hypoderma of cattle. After squeezing the tumor until the larvæ are thrown out, the larval cavity is washed out with salt water. Often, however, an animal that has been washed in the morning will be found at night covered with hundreds of larvæ, which can only be radically exterminated by filling up the holes with tobacco extract (the *savro de cachimba* of the Brazilians), or by dusting them with a dried and pulverized fruit of the *assagria officinalis* (Lindley). It is advisable to leave the larvæ of the dermatobia grow for some days after they are deposited under the skin, so that the pressure exercised in the process of squeezing them out be more efficacious. This is what the natives of South America have learned to do in their plan of "feeding the worms."

Finally, from the preceding considerations, I will conclude :

*First*—That the three parasites removed from the patient in ward 8, Charity Hospital, are the larvæ of an æstrus of the order of the dermatobia (Brauer), which is a native of Honduras, Central America.

*Second*—That these specimens are in all likelihood representatives of a species allied to the dermatobia noxialis (cuterebra noxialis, Gaudot), though presenting marked differences between them.

*Third*—That in removing these parasites from the skin the best method is that of expression (squeezing), combined with a small oblique incision into the orifice of the larval sinus, assisted by the toxic influence of tobacco locally applied in the shape of extract, poultice, hot ashes, etc.

Since reading the above before the New Orleans Medical and Surgical Association I have received, in response to my inquiries, and after submitting to him the specimens for examination, the following valuable and interesting communication from Mr. L. O. Howard, the courteous assistant in charge of the Entomological Division of the United States Department of Agriculture, at Washington, D. C., to whom I am much indebted for this and other favors. It will be noted that Mr. Howard, in confirming my conclusion that these specimens are members of a species of *dermatobia*, emphasizes the opinion that they are not identical with the *dermatobia noxialis*, with which they have been confounded, but are the members of an *undetermined* species, which had been already recognized by Brauer.

Mr. Howard writes in his communication to me: "[The larva] is unquestionably that described by Say in the Journal of the Academy of Natural Sciences, Philadelphia, ii, 334, and in his complete writings, volume ii, page 32, and which he calls *astrus hominis*, reviving the old name of Gmelin. I enclose with this a copy of Say's description, with LeConte's bracketed changes, and also a copy of LeConte's interesting note, which is appended to Say's article in the complete writings. In this note the species is determined as *cuterebra noxialis* (Gaudot). On referring to Brauer, however, I find this identical larva figured, without any mistake (see figure 4 a. b. c.), and mentioned as an *undetermined* species of *dermatobia*. Gaudot's *noxialis* is placed by Brauer in *dermatobia*, and not in *cuterebra*, and the larva is figured from specimens received from Cayenne. The other species, however—viz: the one which you send and the one which Say describes—was received by Brauer from Osten-Sacken, from North America, where it is said to have lived in the head of a man. Brauer also states that it is identical with the larva described by Coquerel from the head of a mule, from Cayenne (see figure 4 d). On referring to Coquerel's paper, however (Annales de la Société Entomologique de France, 1862, page

786), I find that he simply states that it was collected by Dr. Chapuis from a tumor upon a mule, at Cayenne, and no reference is made to the fact that it was found upon *the head* of this mule.

"The larva is then that of an *undetermined* species of *dermatobia*, and it would be very interesting if we could obtain the adult fly. It is probably found in domestic animals all through Central America and northern South America, and may be a species already described, but not

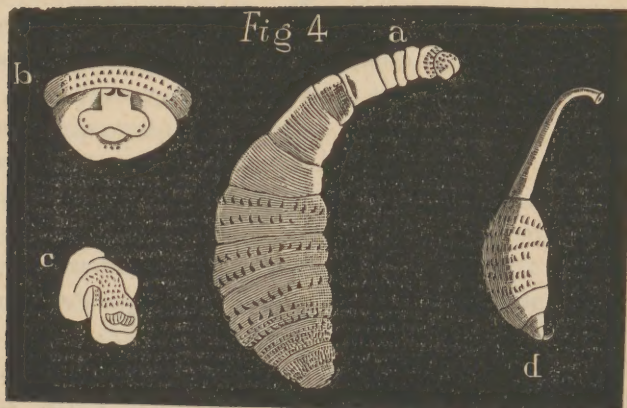


FIG. 4.—*a*, Brauer's figure of entire *Dermatobia* larva supposed to be closely allied to specimens shown in figures 1 and 2. *b*, cephalic extremity; *c*, caudal extremity of same specimen. *d*, *Dermatobia* (larva) figured by Coquerel and closely related to, if not identical with, preceding, only seen under a lower power and perhaps in an earlier period of development. [From figures kindly furnished by U. S. Dept. of Agriculture, Entomological Div.]

connected with its larvæ. It certainly differs from *dermatobia noxialis* as I stated before."

I herewith append Say's description, with Prof. LeConte's interesting annotations, which so accurately describe the larvæ that there can be no further doubt as to their identity. The larvæ themselves I have donated, at Mr. Howard's suggestion, to the National Museum at Washington, where they will be the first to represent their species.

Say's description: "The form of this larva is clavate, the posterior [anterior—Lec.] moiety of the whole length being dilated and somewhat depressed; the segments of



this portion are armed with transverse series of small, black, horny tubercles, dilated at their bases, near their tips, rather suddenly diminishing to a filiform curved hook, pointing forwards [backwards—M.] with an acute termination. These series are *six* in number on the back and sides, placed in pairs, and *three* in number on the abdomen; near the posterior [anterior] termination of the body three hundred and fifty-seven numerous minute tubercles of the same character with the others, excepting that they conform to no regular series. The anterior [posterior—Lec.] moiety of the body is entirely glabrous, cylindrical, or rather elongate conic, of a much smaller diameter than the posterior [anterior] termination of the body; [the segments] are short and the intervening fissure of but little width. Total length, eleven-twentieths; greatest width, more than three-twentieths of an inch.

“ [The larva above described is now supposed to be that of *cuterebra noxialis* (Goudot), for the characters of which see Annales de la Societe Entomologique de France, 2d series, 2, xli. For a detailed discussion of all the facts known on the subject of *æstri* in the human body, consult Keferstein, über *æstrus hominis*, Verh. Zool. Botan. Vereins in Wein, 1856, 637].

“ While traveling in Honduras several of my companions were very much afflicted with similar larvæ. They seem to infest particular portions of the body not usually exposed—the pectoral, dorsal and lumbar regions, the thighs and upper parts of the arm. When the eggs were deposited was entirely unknown to the patients, none of them having ever observed a fly alight on the body; but from the position of the parasite it is most probable that the eggs were laid while the patients were bathing. The effects of these intruders are very much exaggerated in the text. They produce a swelling, having the appearance of an ordinary boil, in which at times is felt, for a few seconds, an acute pain when the worm moves. The method of extraction is very simple and but moderately painful. The tumor is held between the thumb and fore-

finger, a lighted cigar is approached to the skin as near as the patient will permit, when the worm becomes restless, and the point of his body will be seen as a very minute orifice in the skin, not before obvious. The cigar is immediately dropped, and with both hands the tumor is compressed violently; the worm is thus forced out, sometimes with such velocity as to be projected several inches. No inflammation or discharge follows, but the sac immediately closes and heals.

“Sometimes the worm is so small as to resist this mode of extraction. A piece of tobacco leaf is then gummed over the tumor (usually with an exudation from the skin of a plantain); the worm dies in a few hours and is then readily removed by squeezing the part. I have nothing to add to the description of the larvæ in the text, as amended by me, except to say that my specimens were regularly clavate, not at all depressed. The form mentioned above was perhaps owing to contraction produced by the liquor in which the specimen was preserved. The figures given by Mr. Goudot are regularly oval and not at all clavate. The name *gusano del monte* is commonly applied to the worms by the natives, while the insect is called *zancudo gusano*; the word *zancudo* means simply long legged, and it is difficult to understand how it could be applied to a species of *cuterebra*. The natives assured me that the fly was frequently seen; that it was of a grey color and resembled an ordinary mosquito, except in being larger. I imagine that some species of *tipula* was meant. A similar superstition in the United States has conferred upon these harmless insects the fearful title of *gallinippers*.”—*Lec.*

